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(71) Applicant (for all designated States except US): UNITED UTILITIES PLC [GB/GB]; Dawson House, Great Sankey, Warrington WA5 3LW (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): SAGE, Paul [GB/GB]; North West Water Limited, Dawson House, Great Sankey, Warrington WA5 3LW (GB).

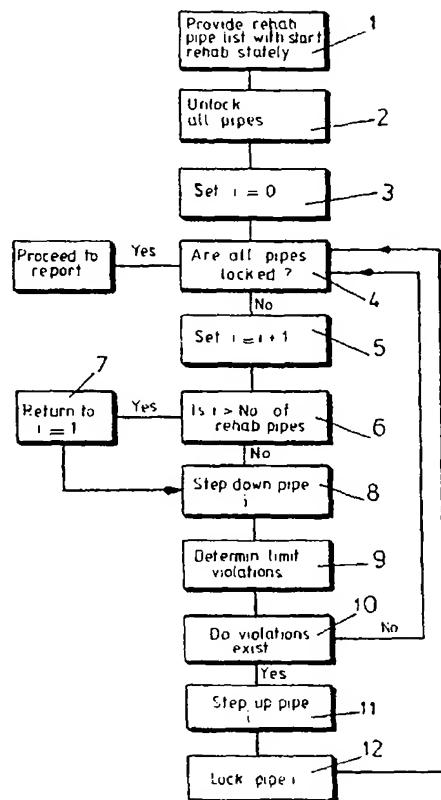
(74) Agent: HOLMES, Matthew, Peter; Marks & Clerk, Sussex House, 83-85 Mosley Street, Manchester M2 3LG (GB).

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[Continued on next page]

(54) Title: PIPE NETWORK OPTIMISATION



(57) **Abstract:** A method of optimising a model of pipe network with respect to a predetermined criteria, such as costs. In particular, the method provides an efficient way of minimising the cost of rehabilitating a water pipe network. The invention provides a method of optimising proposals for pipes within a network without violating operating criteria of the network. The invention further provides the methods of determining the hydraulic significance of pipes within a pipe network, and determining the peak flow requirements of each pipe.

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INTERNATIONAL SEARCH REPORT

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IPC 7 G06F17/50

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	M.COLLINS: "SOLVING THE PIPE NETWORK ANALYSIS PROBLEM USING OPTIMIZATION TECHNIQUES" MANAGEMENT SCIENCE, vol. 24, no. 7, March 1978 (1978-03), pages 747-760, XP001033599 USA page 748, line 7 -page 755, line 20 ---	1
A	US 4 200 911 A (MATSUMOTO KUNIYAKI) 29 April 1980 (1980-04-29) column 3, line 4 -column 7, line 25 ---	1
	-/-	

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *O* document referring to an oral disclosure, use, exhibition or other means
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- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

KELPERIS K.

INTERNATIONAL SEARCH REPORT

Inte	rnal Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	J.ZHANG ET AL: "A BILEVEL PROGRAMMING METHOD FOR PIPE NETWORK OPTIMIZATION" SIAM JOURNAL ON OPTIMIZATION, vol. 6, no. 3, August 1996 (1996-08), pages 838-857, XP001032941 USA page 839, line 1 -page 842, line 24 ---	1
A	G.XUE ET AL: "COMPUTING THE MINIMUM COST PIPE NETWORK INTERCONNECTING ONE SINK AND MANY SOURCES" SIAM JOURNAL ON OPTIMIZATION, vol. 10, no. 1, 1999, pages 22-42, XP001032937 USA page 23, line 27 -page 29, line 34 ---	1
A	E.MATHEWS ET AL: "A NUMERICAL OPTIMIZATION PROCEDURE FOR COMPLEX PIPE AND DUCT NETWORK DESIGN" INT.J.NUM.METH.HEAT FLUID FLOW, vol. 5, no. 5, July 1995 (1995-07), pages 445-457, XP001033595 UK page 451, line 9 -page 452, line 6 ---	1
A	T.LEKANE ET AL: "LONG-TERM OPTIMIZATION MODEL OF TREE WATER NETWORKS" EUR.J.OPER.RES, vol. 4, no. 1, January 1980 (1980-01), pages 7-15, XP001033597 THE NETHERLANDS page 8, left-hand column, line 36 -page 11, right-hand column, line 34 ---	1
A	D.SAVIC ET AL: "GENETIC OPERATORS AND CONSTRAINT HANDLING FOR PIPE NETWORK OPTIMIZATION" SELECTED PAPERS.EVOLUTIONARY COMPUTING.AISB WORKSHOP, 3 April 1995 (1995-04-03), pages 154-165, XP001033594 GERMANY page 155, line 33 -page 158, line 17 -----	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 01/03349

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-23

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-23

A method for optimising a model of a pipe network by modifying the starting proposal for a list of pipes and performing network analysis

2. Claims: 24-28

A method of determining the hydraulic significance of each of a list of pipes within a model of a pipe network

3. Claims: 29-38

A method of determining peak flow rate demands on pipes within a model of a pipe network

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 01/03349

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
US 4200911	A 29-04-1980	JP	53050863 A	09-05-1978